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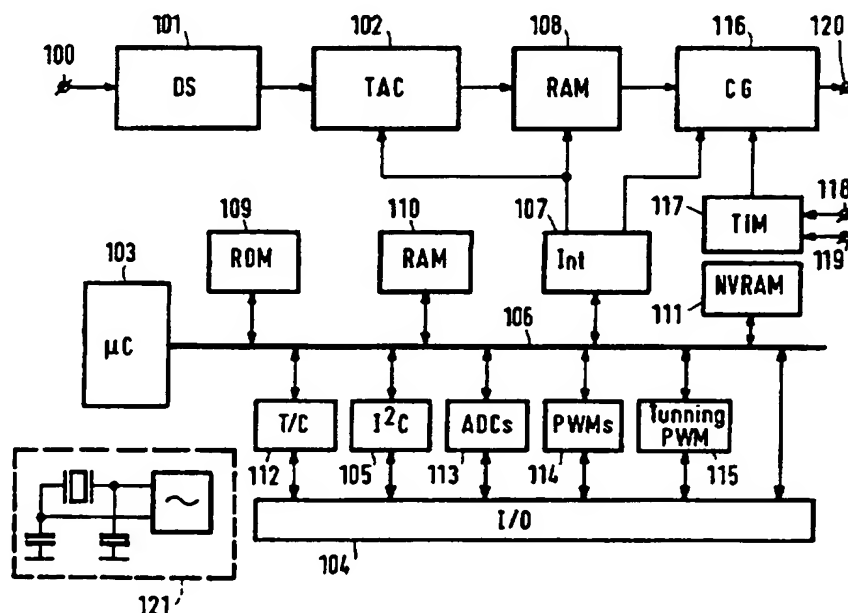
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## Published

With international search report.

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(54) Title: TELEVISION RECEIVER



## (57) Abstract

A television receiver comprises a micro controller (103) for control of tuning, teletext acquisition, on screen display and other functions. It also includes a non volatile memory (111) in which information regarding the source from which a signal is being received is stored under the control of the micro controller (103). The micro controller (103) also enters start and stop times which may be acquired by the teletext acquisition circuit (102). Under control of a user using, for example, a remote control device the micro controller (103) reads the information from the non volatile memory (111) and formats it into information suitable for display to the user to enable the user to monitor the programmes received.

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## DESCRIPTION

## TELEVISION RECEIVER

5           The invention relates to a television receiver.

          Current television receivers normally include a micro controller for controlling various functions within the television set such as programme tuning, on screen displays (OSD) and teletext acquisition and decoding. The teletext acquisition and decoding is frequently provided as a separate custom designed  
10       integrated circuit which communicates with the micro controller. Inputs to the micro controller are frequently from a remote control device via an infra red communications link. Thus typically the user will use the remote control unit to select the particular programme source which he or she desires to watch. This may be for example a number of broadcast television channels or a choice  
15       of channels provided by a cable television network, a satellite receiver or from an external source such as a video cassette recorder or a video disc player. The remote control unit is also used to select a particular teletext page for display and in some instances may be used for additional functions which are specific to a particular television set such as freeze frame and other special  
20       effects.

          It is an object of the invention to provide further user controlled new facilities in a television receiver which incorporates a micro controller.

          The invention provides a television receiver including a micro controller, a non volatile memory, means for detecting the time during which the television  
25       receiver is receiving and displaying a signal from a source, means for detecting the source from which the displayed signal is originated, means for storing in the non volatile memory information indicating the signal source received and the duration for which it is received, means for retrieving on command the stored information from the non volatile memory, and means for displaying the  
30       information in a form intelligible to the user.

          By providing a facility for storing a record of the programmes which have been viewed and displaying that record it is possible for a review of that

information to be provided in a form intelligible to the user. Thus for example parents may monitor the viewing habits of their children.

Another possible use for such a record is in market research in order to monitor viewing figures for a particular programme or for a particular television channel over a given time period. Such a record may be accessed either by  
5 visiting the premises where the television set is located and accessing it by use of keys on the television set or on a remote control unit or by connecting the television set to a communications network, for example a telephone line, and transmitting control signals over the network to cause the information to be  
10 transmitted back to a central monitoring station where the information can be stored for later retrieval either on a display screen or in printed form.

EP-A-294 191 discloses a television receiver having a channel selection apparatus for automatically selecting a predetermined TV channel along with a user's habit or reception pattern for a prescribed period includes an input  
15 device for commanding reception control data for the channel selection, a clock device for generating a time data, a memory device for storing reception control data supplied from the input device for a predetermined period together with time data responding to the reception control data to be stored, a control device for controlling the memory device for a writing reception control data and its  
20 responding time data thereto and a reading out predetermined reception control data with time data responding to the present time and an output device responsive to the control device for receiving the reception control data.

Thus the television receiver disclosed in EP-A-294191 will when it is switched on review the channels to which the television is normally tuned at that  
25 time and on that day of the week by reviewing past records and will tune the television set to the appropriate channel. Thus it tunes the television set to accord with the viewing habits of the owner but it does not, however, make available the possibility of displaying those habits in the form of a displayed or printed list of programmes which have been viewed.

30 As the television receiver is controlled via the micro controller, the micro controller has a knowledge of which source the television set is tuned to at any given time. The micro controller may not know the absolute time since it may

not have a real time clock available to it. The majority of television sets currently produced, however include a teletext decoder and a time signal is transmitted on row zero of every page of the teletext signal and the micro controller can access this time information and may use that to determine the absolute start and stop times of receiving any particular programme.

There may be a number of sources where no associated teletext signal is transmitted, one example being when a video cassette recorder is connected as the input to the television receiver where even if it were possible to record a teletext signal with the programme the teletext clock would relate to the time at which the programme was recorded rather than that at which it was replayed. Under those circumstances a real time clock may not be available but the micro controller will be driven by a clock signal whose periods can be counted to determine the length of time during which a given source is being displayed. The display of the information may be arranged so that it is in chronological order, in which case the time during which the video recorder or other programme source without an associated teletext signal is connected may be indicated by the fact that it occurs between the times of two programmes where a real time clock is available.

The information displayed may be formatted in any convenient form. For example it could be arranged as a list in chronological order of particular programme sources received. This may include programme titles which may be obtained from the teletext programme information or from PDC signals which are broadcast by certain broadcasting authorities.

Alternatively or in addition the micro controller may be programmed to disable the tuning to selected programmes. Thus for example a user may have a PIN number which allows him or her to access the non-volatile memory via the micro controller so that certain programme sources can be barred either permanently or at selected times. This can be used for example to enable a parent to prevent a child accessing unsuitable programmes. An additional or alternative facility which may be programmed by the user is to programme a total time limit for the viewing of the television set. For example it may be that a parent would programme a television set in a child's bedroom so that it would

not operate after say 10 o'clock in the evening or to programme it so that the child may not watch more than say two and a half hours of television programmes. This requires the micro controller to be able to decode a PIN number which may be entered by means of the remote control unit to enable  
5 the particular instructions to be executed.

Embodiments of the invention will now be described, by way of example, with reference to the accompanying drawings, in which:-

Figure 1 shows in a block schematic form a television receiver according to  
10 the invention,

Figure 2 shows a block diagram of the micro controller and teletext acquisition circuits,

15 Figure 3 is a data flow diagram,

Figure 4 is a flow diagram illustrating the process by which the programme information received is stored, and

20 Figure 5 is a flow diagram illustrating the retrieval and display of the programme information stored.

As shown in Figure 1 an aerial 1 is connected to the input of the front end 2 of a television receiver, the front end performing the usual RF amplification, demodulation, and detection functions as is well known in the television art. The front end operates under the control of a micro controller 3  
25 which receives, from an infra red receiver 4, signals which represent the pressing of keys on a remote control unit (not shown). The demodulated video signal is passed over a path 5 to a T.V. processor 6. This provides the usual video signal processing to allow colour decoding, the generation of  
30 synchronising pulses, etc. A combined video and blanking signal is supplied over a line 7 to the micro controller and teletext acquisition circuit 3 as are synchronising pulses over a line 8. These are the normal television horizontal

and vertical synchronising pulses. The micro controller and teletext acquisition circuit 3 provides an output over a line 9 which is an RGB signal which is fed to the television processor 6. The RGB signals are fed via a line 10 from the T.V. processor 6 to video amplifiers 11 and thence to a display device 12, while  
5 audio output signals are fed via a line 13 to audio amplifiers 14 and to a loudspeaker 15.

Figure 2 shows in greater detail the micro controller and teletext processing circuit 3 shown in Figure 1. The arrangement has an input 100 which receives the combined video and blanking signal (CVBS) which is  
10 present on line 7. The input 100 is connected to a data slicer 101. The data slicer 101 feeds a teletext acquisition circuit 102 which acquires and decodes the teletext transmissions. A micro controller 103 receives, via input/output ports 104 over an I<sup>2</sup>C Bus 105, control information from a remote control unit by means of which the viewer can select a programme to be viewed and/or  
15 other facilities such as teletext and on screen displays (OSD). The micro controller 103 puts out instructions over a bus 106 via an interface 107 to the teletext acquisition circuits 102 which causes it to acquire a selected page in response to the input signals received from the remote control unit. A selected page is fed into a page memory 108. Also attached to the bus 106  
20 is a read only memory 109, a random access memory 110, a non volatile random access memory 111, timer counter circuits 112, analogue to digital converters 113, pulse width modulators 114, and a tuning pulse width modulator 115. These are all connected to the other circuits within the television receiver through the input/output ports 104. The micro controller 103  
25 is also connected via the bus 106 and interface circuit 107 to the teletext page RAM 108 and to a teletext character generator 116. The character generator 116 also receives timing pulses from a display timing generator 117 which is fed via input 118 and 119 with the vertical and horizontal synchronising pulses. The character generator 116 produces an RGB output at 120 which is fed over  
30 the line 9 to the T.V. processing circuits for amplification and application to the display device. The micro controller 103 also receives clock pulses from a clock generator 121.

Figure 3 illustrates the sequence of events to enable a display of the programmes viewed by a viewer.

Block 201 represents switch on of the television receiver. Block 202 represents the gathering of data by the micro controller. This data comprises  
5 the signal source which is to be displayed, i.e. the channel number to which the set is tuned or the connection to an auxiliary signal source such as a video recorder and the times during which these sources are displayed. Since the micro controller controls the tuning of the set it will contain the data which defines which signal source is being displayed. The times at which this data  
10 changes, i.e. switch on, switch off, channel change etc., may be determined using either internally generated clock signals or, when available, by accessing the real time clock transmitted in teletext signals associated with the received programmes. Block 203 represents the storage of this data in a non-volatile RAM so that this information is retained when the television set is switched off.

15 When the user wishes to review the programmes viewed over a given period he will request the data, Block 203, normally using a remote control unit to provide instructions to the micro controller. The micro controller then reads the requested data from the non volatile RAM, Block 204, and converts it into a display format, Block 205, which may be predetermined or which may be  
20 specified by the user using the remote control device. The formatted data is then applied to the display device, Block 206.

Figure 4 is a flow diagram showing the operation of the micro controller as far as it is relevant to the storage of which programmes are being displayed and the time during which they are being displayed. The micro controller will  
25 also be performing the normal control tasks to control the television receiver. The start of the routine is on switch on of the television receiver which is represented by box 401. The first process through which the micro controller goes is to initialise its state, box 402. This is common to the whole of its control process, that is it sets itself to an initial state which will enable control  
30 of the television set and monitoring of its operation. The next stage represented by box 403 is to detect the time at which the receiver was switched on. This may take different forms, but in one example it comprises the



acquisition of row zero of a teletext page which contains a real time clock. If there is no transmission of a real time clock whether on a teletext page or otherwise then the micro controller may start a timer which counts the number of its clock periods. This will enable the length of time during which the receiver is operating to be determined but will not give the actual time or dates. The next stage represented by box 404 is to detect the programme being viewed. The micro controller will, during the course of its standard control of the operation of the television set, know to which programme source the television set is tuned, since it controls the television tuner. Thus it will be able to say to which channel the television set is tuned, whether from a broadcast programme or from cable television. It will also know which input to the television set is active, for example an auxiliary input to which a video recorder or video disc player may be connected. The micro controller will then cause the start time and the programme being viewed to be entered into the non volatile memory. This is represented by box 405. The micro controller then goes into a loop which enables it to monitor whether or not the programme source is changed, box 406. If no change is detected the micro controller just sits in a given state monitoring whether or not a change subsequently takes place. If a change is detected then the micro controller stores the time at which the change is detected as the end of a particular programme; this is represented by box 406. A decision is then taken, box 408, as to whether the programme change is a change to a new programme source or whether it is due to the television receiver being switched off. If the change is due to the television receiver being switched off then the process terminates. If the change is not due to the television receiver being switched off then the programme loops back to the input of the detect time box 404.

This process depends on a delay between operating the power off button and the loss of power to the micro controller and associated circuitry. If such a provision of power to the micro controller after the power off button has been operated is not provided an alternative method for ensuring the programme end time is at least approximately stored is to store an updated time periodically as the stop time, for example every five minutes. Thus a

provisional stop time is always present in the non volatile memory provided that the set is switched on for longer than the update period.

By this means the start and stop times of each programme received may be stored in the non volatile memory. The period over which such information is stored will depend on the capacity of the non volatile memory. It may for example be for a 24 hour period or could with sufficient memory capacity be stored over a longer period such as a week.

A possible refinement which will prevent children from filling the memory by quickly switching from channel to channel until all the storage locations are filled is to cause the programme to be stored only if it is received for a minimum time, for example 5 minutes. The actual time will be a compromise so that it is sufficiently long to make channel hopping merely to fill the memory unattractive but sufficiently short that a meaningful viewing of the programme is not possible without exceeding that time. Various other features may be introduced to make it more difficult for children to prevent accurate monitoring of their viewing habits, for example it could be detected whether a programme source was being selected for periods close to the maximum time before the programme information would be stored, momentarily switching to another source and then switching back to the original source, by keeping a running total of the times that a particular source was selected over a period of say half an hour.

An alternative approach for parental control could be to use the non volatile memory to bar the tuning of the television receiver to selected programme sources for selected periods. Thus if it is deemed that an unsuitable programme appears on channel 1 between 8.30 and 9 o'clock in the evening it would be possible to enter that information into the non volatile memory using the remote control and a PIN number which is known only to the parent. The micro controller would then monitor the contents of the non volatile memory and inhibit tuning to that particular programme for the period set. This could also inhibit other sources such as video recorders and video disc players being operated between appropriately programmed times, for example when the parents are out.

Having obtained the information and stored it in the non volatile memory it is then necessary to enable the viewer to review the information stored. To effect this process the viewer uses the remote control unit to signal to the micro controller that he wishes to have the information displayed. If desired the use of a PIN number to enable the display request can be utilised so that only the parent can access this information. This is represented by box 501 in Figure 5. The next step is for the micro controller to read the appropriate contents of the non volatile memory, this is represented by box 502. The micro controller then processes the data into a form suitable for display, this is represented by box 503. The next step is to write the processed data to the display memory which enables the character generator to generate the display information, this is represented by box 504. The micro controller then causes the output of the character generator to be applied to the video amplifiers, represented by box 505, and completes the process which ends, box 506.

The display data can be formatted in any convenient form, for example it may be just a chronological list of the source that the television set was tuned to and the times for which it was tuned to that particular source. Other ways of displaying the data are possible depending on how the micro controller is programmed to process it. For example the display could merely indicate the number of hours for which the television set has been switched on during a given period, for example the last 24 hours. It could merely give an indication for example by means of bar charts, as to how long each particular source was received regardless of the particular times during which the source was active, for example it may indicate that channel 1 was received for two hours, channel 2 for half an hour, channel 3 for six hours, etc. Another indication may be merely that the set was switched on between certain hours. Exactly what information is displayed is dependent on how the micro controller is programmed to process the information stored in the non volatile memory and the way in which the micro controller is programmed to detect and store the information originally.

Various other modifications are possible within the scope of the present invention, for example instead of using the real time clock transmitted by the

teletext signal it is possible to incorporate a clock within the television receiver which is battery powered when the receiver is switched off and which the micro controller may access. In this way it is not reliant on the source of the signal for absolute time information.

5           From reading the present disclosure, other modifications will be apparent to persons skilled in the art. Such modifications may involve other features which are already known in the design and use of television receivers and component parts thereof and which may be used instead of or in addition to features already described herein. Although claims have been formulated in  
10 this application to particular combinations of features, it should be understood that the scope of the disclosure of the present application also includes any novel feature or any novel combination of features disclosed herein either explicitly or implicitly or any generalisation of one or more of those features which would be obvious to persons skilled in the art, whether or not it relates  
15 to the same invention as presently claimed in any claim and whether or not it mitigates any or all of the same technical problems as does the present invention. The applicants hereby give notice that new claims may be formulated to such features and/or combinations of such features during the prosecution of the present application or of any further application derived  
20 therefrom.

## CLAIMS

1. A television receiver including a micro controller, a non volatile memory, means for detecting the time during which the television receiver is receiving and displaying a signal from a source, means for detecting the source from which the displayed signal is originated, means for storing in the non volatile memory information indicating the source from which the signal is received and the duration for which it is received, means for retrieving on command the stored information from the non volatile memory, and means for displaying the information in a form intelligible to the user.

2. A television receiver as claimed in Claim 1 further including a teletext decoder, wherein the time determining means comprises means for monitoring the teletext real time clock in row zero of a teletext page.

3. A television receiver as claimed in Claim 1 or Claim 2 in which the time determining means comprises counting means which is arranged to count clock cycles of the micro controller clock signal for the time during which a signal from a given source is received.

4. A television receiver as claimed in Claim 1, 2, or 3 including a remote control unit by means of which a user can request the information display.

5. A television receiver as claimed in Claims 1, 2, 3 or 4 including means for inhibiting or deleting storage of the programme source and time information if a source is received for less than a given period.

6. A television receiver as claimed in Claim 5 including means for storing programme source and time information if a signal from the same source is received more than once within a second longer given period if the total time during which a signal from that source is received within said second

given period exceeds the first given period.

7. A television receiver including a micro controller, a non volatile memory, means for entering programme source and time information into the non volatile memory, and means for inhibiting the reception of a signal from the source during the time period which source and time period are represented by the information entered into the non volatile memory.

8. A television receiver as claimed in Claim 7, wherein entry or alteration of the information in the non volatile memory is restricted to a user who has a personal identification number, the micro controller being arranged to allow alteration of the information only if the personal identification number has been received.

9. A television receiver substantially as described herein with reference to the accompanying drawings.

10. Any novel feature or novel combination of features disclosed herein either explicitly or implicitly whether or not it relates to the same invention as that claimed in any preceding claim.

1/4

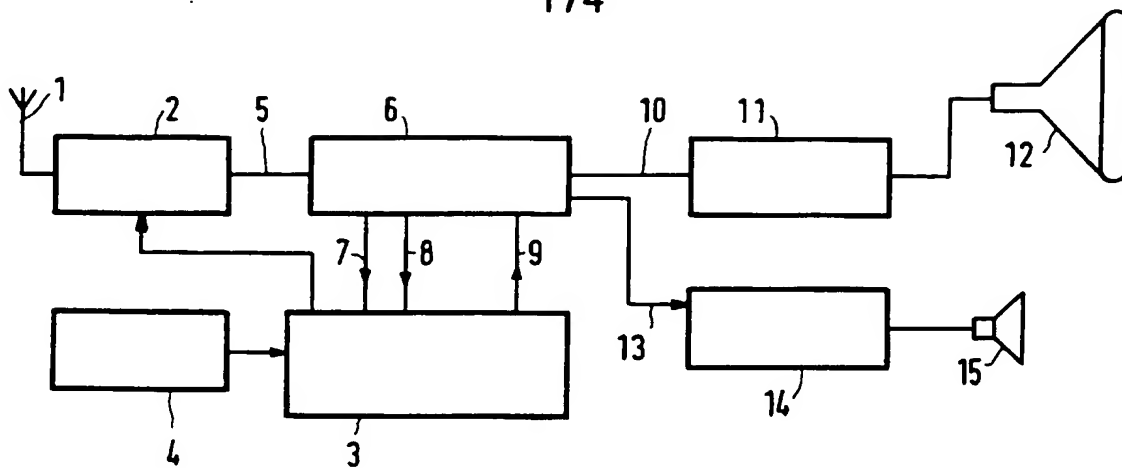


FIG. 1

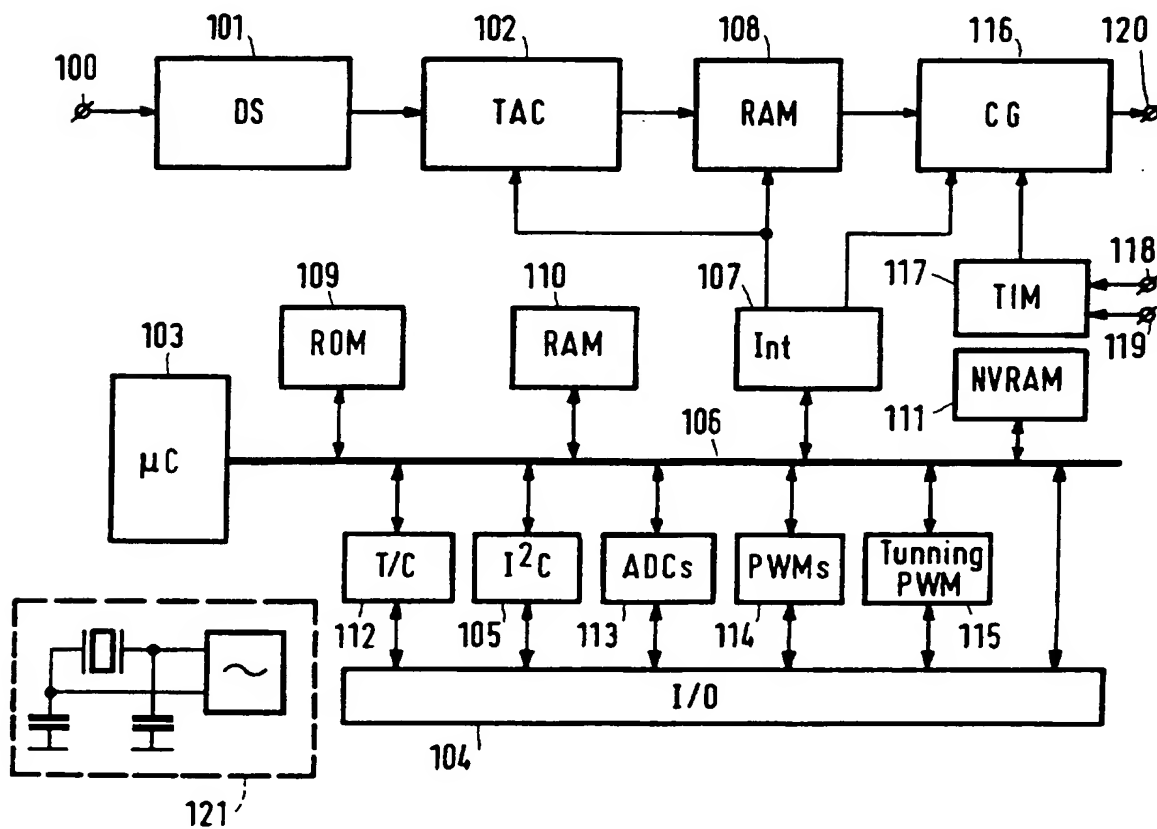


FIG. 2

2/4

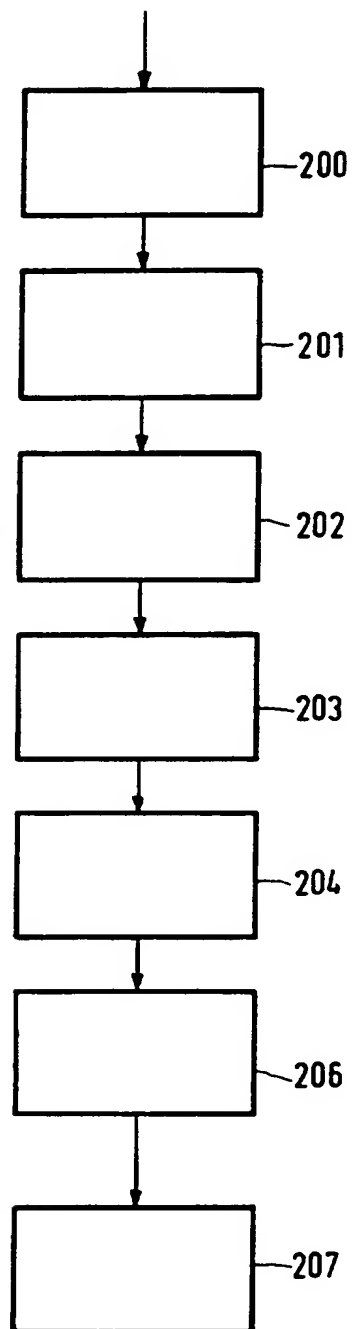


FIG.3



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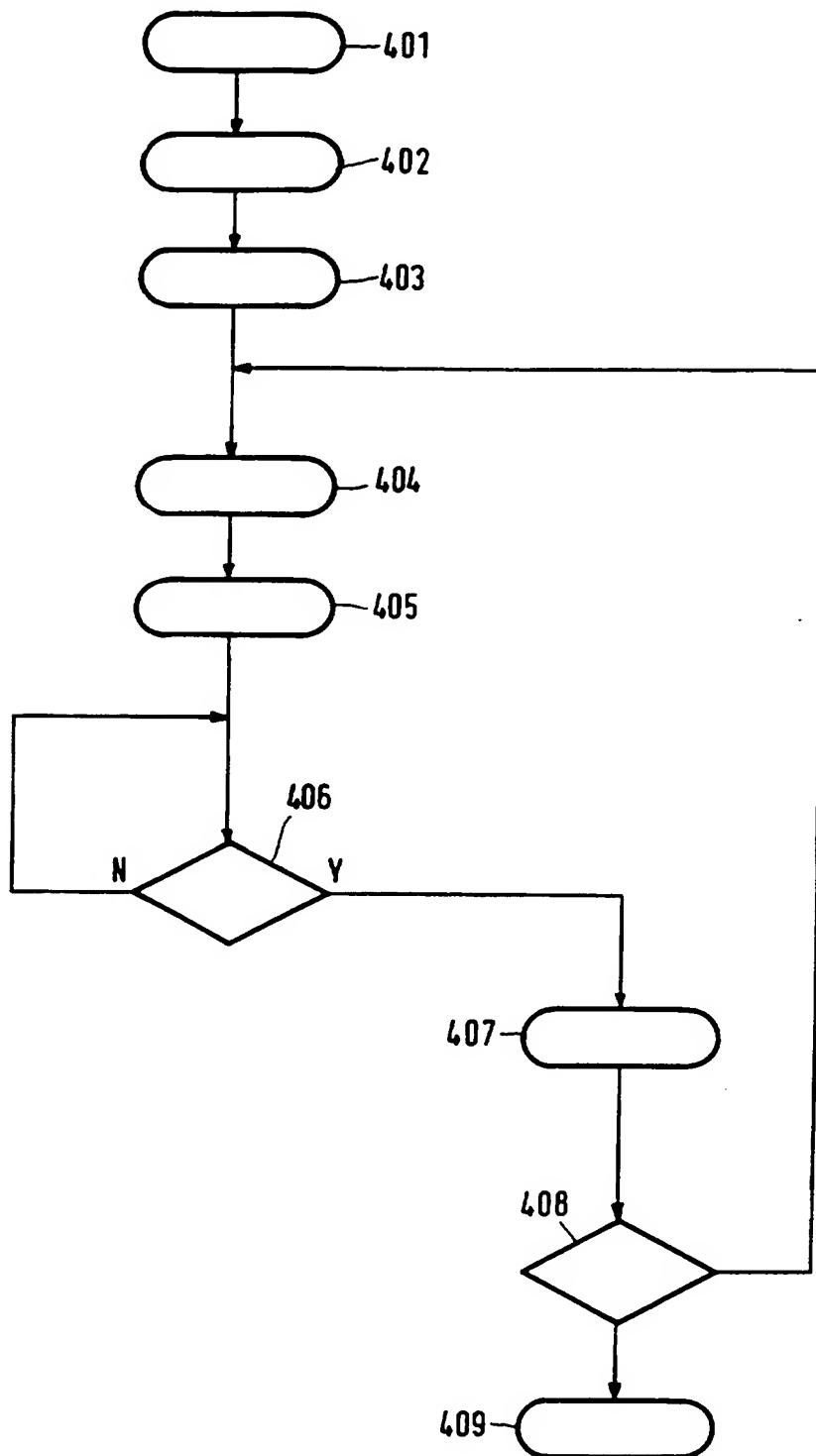


FIG. 4

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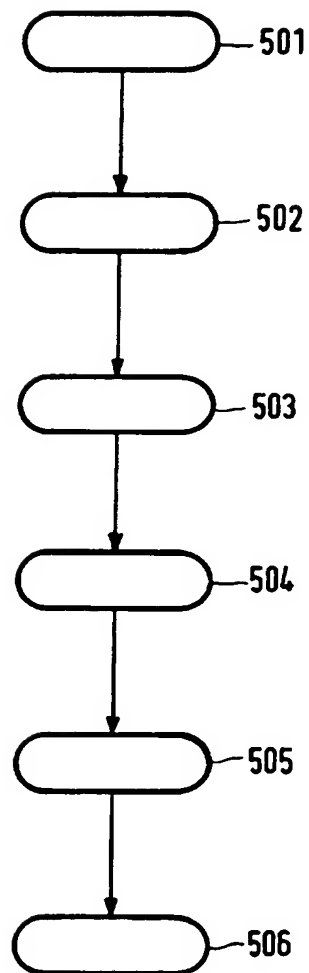


FIG.5

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/IB 95/01051

## A. CLASSIFICATION OF SUBJECT MATTER

IPC6: H04N 7/16, H04N 5/445, H04N 7/088

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: H04N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	Patent Abstracts of Japan, Vol 10, No 251, E-432, abstract of JP, A, 61-79390 (PIONEER ELECTRONIC CORP), 22 April 1986 (22.04.86)	1,3,4,10
A	--	2,5,6
X	DE 4308190 A1 (STRZYGOWSKI, STEFFEN), 22 Sept 1994 (22.09.94), see whole document	7-8,10
P,X	WO 9510916 A1 (KWOH, DANIEL, S.), 20 April 1995 (20.04.95), page 7, line 16 - page 8, line 11; page 11, line 8 - page 12, line 25	7-8,10
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☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

- \* Special categories of cited documents:
- "A" document defining the general state of the art which is not considered to be of particular relevance
- "B" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed
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Date of the actual completion of the international search

28 May 1996

Date of mailing of the international search report

29 -05- 1996

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**PCT/IB 95/01051**

## C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Form PCT/ISA/210 (continuation of second sheet) (July 1992)

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/IB 95/01051

## Box I Observations where certain claims were found unsearchable (Continuation of Item 1 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☒ Claims Nos.: 9  
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:  
-the invention claimed in claim 9 relies on references to the drawings. It is considered not to be necessary to refer to the drawings to described the claimed invention. (See Rule 6.2 (a))
3. ☐ Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐  
☐

The additional search fees were accompanied by the applicant's protest.

No protest accompanied the payment of additional search fees.

**INTERNATIONAL SEARCH REPORT**  
Information on patent family members

01/04/96

International application No.  
PCT/IB 95/01051

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE-A1- 4308190	22/09/94	NONE	
WO-A1- 9510916	20/04/95	NONE	
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